

1. A method for forming a small, microelectronics device having a sharply defined patterned shape and surrounded by a dielectric layer having an upper surface that is substantially co-planar with the upper surface of said device, using overlapping suspension-bridge shaped photolithographic masks comprising:

providing a substrate;

forming on said substrate a device layer to be patterned;

forming on said device layer a first suspension-bridge shaped photomask, said photomask including two end portions connected by a central portion, wherein each of said end portions rests upon a pedestal base formed upon said device layer and whereby said central portion is suspended above said layer supported by said end portions;

using said first photomask as an etching mask and applying a first downwardly directed etch, removing all portions of said device layer except that portion vertically beneath said mask, the remaining portion of said device layer thereby having a sharply defined first patterned shape which is substantially the shape of said mask;

using said first photomask as a deposition mask, forming a first dielectric refill layer within said removed device layer portions, the upper surface of said refill layer and the upper surface of said first patterned device layer being substantially co-planar;

removing said first photomask;

forming a second suspension-bridge shaped photomask on said first refill layer, the second mask being structurally similar to the first mask, wherein each pedestal base portion of said second photomask is formed on the refill layer and the suspended portion

of said second photomask is suspended substantially orthogonally over said first patterned device layer;

using said second photomask as an etching mask and applying a second downwardly directed etch, removing all portions of said first patterned device layer and said refill layer except those portions vertically beneath said second photomask, the remaining portion of said first patterned device layer thereby having a sharply defined second patterned shape;

using said second photomask as a deposition mask, forming a second dielectric refill layer within all portions of the first refill layer and first patterned device layer removed by said second etch, the upper surface of said second refill layer and the upper surface of said second patterned device layer being substantially co-planar;

removing said second photomask.

2. The method of claim 1 wherein said first and second etches are ion-beam etches.
3. The method of claim 1 wherein said first and second dielectric refill layers are formed by a line-of-sight ion-beam deposition.
4. The method of claim 1 wherein said first and second dielectric refill layers are layers of alumina.
5. The method of claim 1 wherein said device layer to be patterned is a TMR device layer, an MRAM device layer or a GMR device layer.

6. The method of claim 1 wherein said first and second masks have a substantially rectangularly shaped suspended central portion and wherein said second patterned shape is a square.

7. The method of claim 1 wherein the shape of the central portion of said first and second suspension bridge shaped mask is chosen to form a second patterned shape of arbitrary form.

8. The method of claim 1 further including the formation of an upper conducting electrode on the isolated device, said formation comprising:

forming a pair of separated bi-layer lift-off masks having undercut pedestal supports, said masks being symmetrically laterally disposed to either side of said isolated second patterned layer and a space between said masks allowing a deposition of conducting material on said isolated second patterned layer;

depositing a conducting electrode layer on said isolated device through said space.